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Structure-property relationship in silicone networks

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Silicone networks find use in broad range of applications in electronic, medical, automobile, aerospace and many other industrial fields. The inherent softness and strong covalent bonds between silicium and oxygen provide the silicone network with most of its favorable properties such as thermal and oxidation stability, flexibility, hydrophobicity, and low surface energy. However, silicone elastomers suffer from poor mechanical properties due to the inherent softness of the network. The mechanical properties of the silicone networks can be improved e.g. by addition of fillers or by chemical modification of the network. Nevertheless, such modifications often comes together with deterioration of some of the desirable properties mentioned above.[1]

In this work, different silicone network structures (Fig.1) and their input on the mechanical properties will be investigated with the mail goal to maintain the favorable properties of silicone elastomers while improving the mechanical properties. The different types of silicone network structures will be formed by condensation curing reaction and evaluated with respect to the mechanical properties and long-term stability.

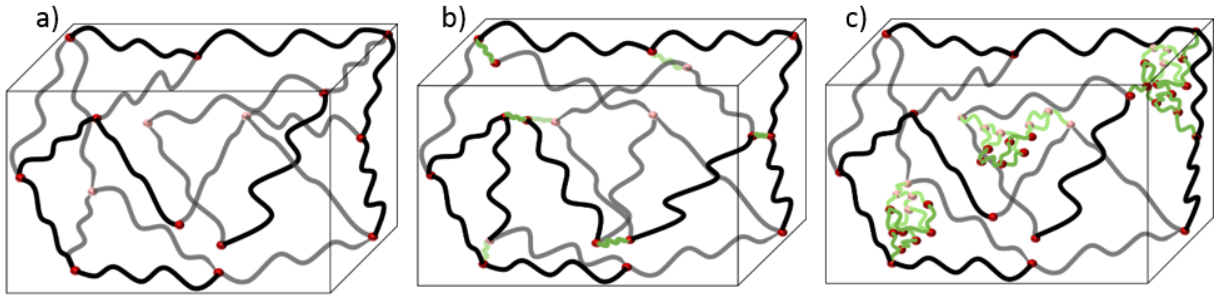

Figure 1. Schematic illustration of different silicone networks structures. a) unimodal network, b) homogeneous bimodal network, and c) heterogeneous bimodal network.

[1] Shit, S. C., & Shah, P. (2013). A review on silicone rubber. *National Academy Science Letters*, *36*(4), 355–365. https://doi.org/10.1007/s40009-013-0150-2.